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Sustainable Competitive Advantage through Green Product Innovation: A Study of Small and Medium Food Enterprises in West Java, Indonesia

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Abstract

This study aims to analyze the influence of Market Orientation, Competition, Technology, and Entrepreneurship Orientation on Sustainable Competitive Advantage through Green Product Innovation in food SMEs in West Java. Using a quantitative approach, this study involved 380 respondents selected through stratified random sampling. Data were collected through questionnaires and analyzed using Structural Equation Model-Partial Least Square (SEM-PLS). The results indicate that all independent variables have a significant positive influence on Green Product Innovation and Sustainable Competitive Advantage. However, in the mediation analysis, only the relationship between Technology and Sustainable Competitive Advantage was significantly mediated by Green Product Innovation. This finding highlights the crucial role of technology in driving green innovation and achieving long-term competitive advantage. This study contributes to the understanding of green innovation dynamics in the context of food SMEs in West Java. The implications suggest the need to focus on developing technological capabilities and green innovation to enhance sustainable competitiveness. The study also emphasizes the importance of integrated policy support to facilitate the transformation of SMEs toward more sustainable and globally competitive business practices.

Keywords: *Green Product Innovation, Sustainable Competitive Advantage, Food SMEs, West Java, Technology.*

INTRODUCTION

In an era of globalization and increasingly complex competition, companies face significant challenges in maintaining their competitive advantage. Globalization pressures, rapid technological changes, and growing consumer awareness of environmental issues are driving companies to design innovative strategies that go beyond mere economic performance, focusing on the sustainability dimension (Setiadi et

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al., 2025). Green Product Innovation (GPI) has emerged as a crucial strategic approach to achieving sustainable competitive advantage (Zhu et al., 2023). GPI has now become a vital strategic pillar for companies in gaining and maintaining their competitiveness amid intense competition (Li et al., 2022). This strategy not only improves financial performance but also integrates sustainability values as a response to high consumer ecological awareness and increasingly stringent regulations (Liu et al., 2023).

Companies adopt a holistic approach, including sustainability training, innovative policies, green human resource management (Green HRM), and the use of disruptive technologies such as blockchain, to proactively respond to challenges and opportunities in the dynamic global business ecosystem (Zhu et al., 2023; Sult et al., 2024).

GPI plays a crucial role in balancing competitive advantages with environmental responsibility, while strengthening corporate reputation and expanding market share (Zhu et al., 2023 ;Sult et al., 2024). Companies that consistently apply environmentally friendly innovation principles tend to build a positive image, increase customer loyalty, and strengthen brand value. Research indicates that environmentally friendly products have the potential to reach a broader market segment due to shifting consumer preferences toward sustainable products (Trevlopoulos et al., 2021). Although GPI offers substantial benefits, challenges remain. Some companies still prioritize short-term profits, which can hinder long-term environmental goals and weaken competitiveness. The relationship between GPI and sustainable competitive advantage is complex, influenced by company performance, environmental regulations, and internal capabilities (Zhou et al., 2020; Bhatia & Jakhar, 2021). Environmental technology innovation is also crucial for addressing issues such as air pollution and can become a competitive advantage if supported by a strong environmental regulatory framework (Mbanyele & Wang, 2021; Ozkan et al., 2023).

The concept of green product innovation has evolved into various variants designed to reduce negative environmental impacts while improving product performance, such as eco-friendly products, energy efficiency, and waste-free products, all of which support sustainable development (Reddy et al., 2023). GPI refers to product design with the lowest possible ecological impact, often by utilizing recyclable or biodegradable materials. Sustainable products are designed to minimize negative environmental impacts throughout their entire lifecycle, from raw material extraction to final disposal (Andersén, 2022; Zhang et al., 2022). This holistic approach encompasses various types of products, such as renewable energy technologies and naturally

biodegradable materials. However, its development and implementation still face challenges such as high production costs and the need for more advanced technological innovations (Richnák & Fidlerová, 2022). A comprehensive transformation of industrial systems and changes in consumer behavior are also necessary to realize significant sustainability benefits.

In West Java, green product innovation in the food industry is a key strategy for achieving sustainable competitive advantage, given the high level of food consumption in this region. This approach involves synergy between market orientation, competitive intensity, technological advancement, and entrepreneurial spirit to meet consumer demand for environmentally friendly food products (Tuan, 2022; Tjahjadi et al., 2020). As the most populous province, West Java offers a vast market potential for the food industry, particularly with the increasing urbanization and growing trend toward instant or processed food consumption, creating significant opportunities for businesses. However, this industry also faces major challenges, including demands for environmentally friendly production, stricter government regulations regarding waste management and packaging, and intense competition from both local and global players. Therefore, innovative strategies focused on sustainability principles are urgently needed (Utama & Abirfatin, 2023).

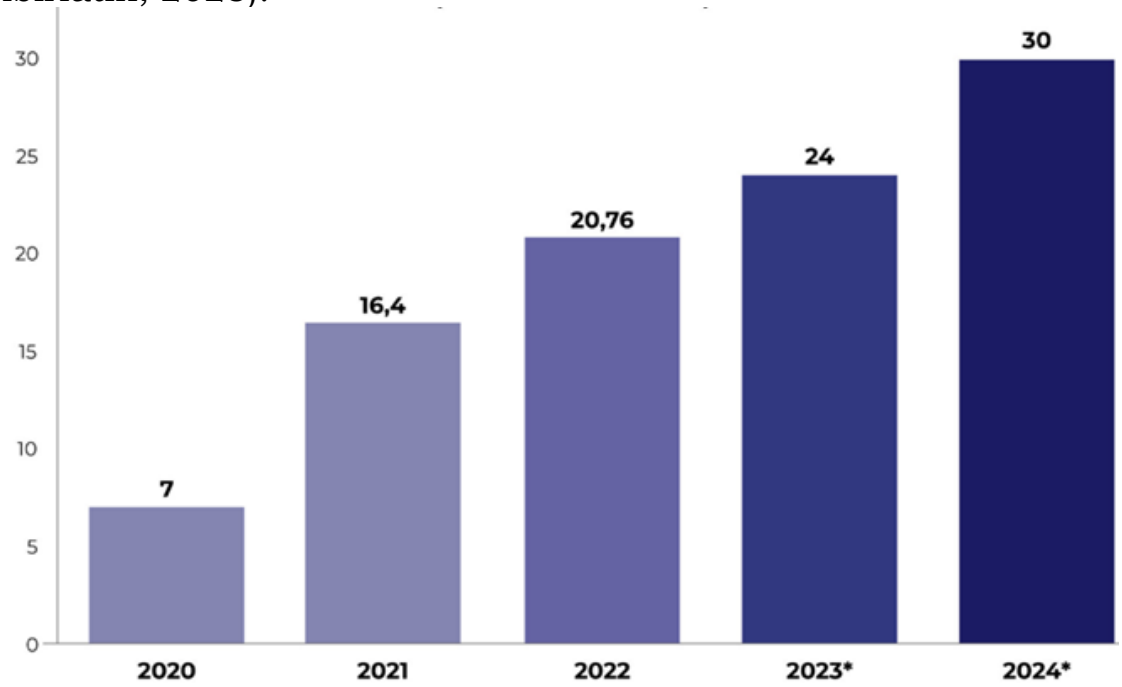

Figure 1. Number of SMEs Entering the Digital Ecosystem Digital Ecosystem in Indonesia 2020-2024

Figure 1 shows that the food and beverage industry has made a significant contribution to Indonesia's GDP, which continues to grow, despite annual growth fluctuations indicating vulnerability to external shocks such as the pandemic (Saryatmo

& Sukhotu, 2021; Srimulyani & Hermanto, 2021). West Java's economic growth has also been positive, driven by key sectors and the vital contribution of SMEs, which serve as the backbone of the regional economy, particularly in terms of local (Faeni et al., 2022). The digital transformation of SMEs in Indonesia is also rapid, with projections of 30 million SMEs joining the digital ecosystem by 2024, driven by the trade and food sectors, although infrastructure and digital literacy remain challenges (Kilay et al., 2022).

One of the main challenges faced by food SMEs is maintaining sustainable competitive advantage (SCA). SCA refers to a business's ability to create greater value for consumers through unique strategies, operate more effectively than competitors, or do things that cannot be replicated (Fabrizio et al., 2021; Castellano et al., 2022). SCA can be achieved by continuously adapting to external trends and internal capabilities, and formulating strategies that strengthen these factors (Sawe et al., 2021; Bacinello et al., 2020). SCA strategy positions companies strongly against competitors, provides the strongest sustainable strategic advantage, and prioritizes the best service to consumers (Sarfraz et al., 2023). The sustainability of a company depends heavily on its ability to maintain unmatched competitive advantages, create unique value, and generate long-term growth (Hussein et al., 2024).

Companies face innovation pressures from competitors, governments, society, and investors. In the modern era, corporate objectives have expanded beyond mere profitability to long-term business sustainability, requiring strategies that consider environmental impacts. Green Innovation (GI) is a strategy that enables companies to develop their businesses sustainably in accordance with regulations. GI encompasses environmentally oriented product or process innovations, such as the use of environmental management technologies (Yin et al., 2023 ; Huong et al., 2021). Green Product Innovation (GPI) specifically focuses on improving raw material efficiency for environmentally friendly products, which also reduces costs and can generate additional income from waste processing (Muangmee et al., 2021). GPI involves developing products that consider the entire life cycle, from selecting environmentally friendly raw materials to recyclable packaging, creating economic and ecological value. It integrates sustainability principles into product design to minimize environmental impact and provide a competitive advantage, meeting the demands of increasingly environmentally conscious consumers (Majali et al., 2022a). However, food SMEs face various challenges in implementing GPI, including financial constraints for initial investments, lack of knowledge, limited access to technology and expensive green raw materials, regulatory complexity, insufficient government

support, and low market demand for green products (Kumar et al., 2022).

Market Orientation (MO) is an important variable in driving GPI and SCA. By understanding market needs and consumer trends that prioritize sustainability, companies can develop environmentally friendly products that meet customer expectations (Luu, 2022). MO drives sustainable innovation in processes and products, the use of sustainable raw materials, and the adoption of green technology, which in turn enhances product value and creates sustainable competitive advantages (Afum et al., 2022). MO is defined as a company's ability to continuously improve efficiency while creating added value for customers, with a focus on gathering information about the needs of target customers and the capabilities of competitors, and utilizing it to create sustainable customer value (Ahmad et al., 2022; Kazmi et al., 2021). However, food SMEs often face challenges in implementing MO due to limited resources, difficulties in collecting and analyzing market information, and adapting to changes in consumer preferences and digital marketing technologies. Previous research has shown inconsistencies regarding the impact of MO on sustainable competitive advantage, despite traditionally being considered a key driver. Recent findings reveal that its influence is insignificant or even negative on sustainability aspects if sustainable practices are not integrated (Afum et al., 2022). This indicates a significant gap between theoretical expectations and practical implementation in the field (Tjahjadi et al., 2022).

Competition is an inevitable condition for SMEs, requiring the development of innovative strategies to enhance competitive advantage (Gul et al., 2021). A company's marketing strategy is closely related to Customers, the Company, and Competition, with a focus on effectively positioning itself among competitors and providing greater value to customers (Wang et al., 2022; Skordoulis et al., 2022). Theoretically, long-term market competition should provide maximum benefits, but anti-competitive actions require intervention. Competition can increase companies' short-term orientation and risk, which may reduce competitiveness if long-term investments are delayed. While some studies confirm that competition significantly influences sustainable competitive advantage, others find that high competition can reduce the sustainability of competitive advantage (Xue et al., 2022; Dagnino et al., 2020). Existing advantages, while providing short-term benefits, can create lock-in effects that limit a company's flexibility to adapt to new market dynamics, thereby reducing strategic adaptability over time.

Technology is the primary benefit and continues to evolve rapidly, entering the digital era that facilitates various business fields (Fedyk et al., 2022). Technological advancements, such as

artificial intelligence (AI), have enhanced the ability to perform tasks previously only possible by humans, but also raise concerns about job displacement (Georgieff & Hyee, 2022). Technology is now inseparable from daily life, enabling instant global access to information (Almaiah et al., 2023). Small and medium-sized enterprises (SMEs) must prioritize technology integration to enhance security, transparency, and consumer trust, while leveraging AI for personalized services and real-time fraud detection (Grimmelikhuijsen, 2022; Awosika et al., 2024). Technology philosophy also addresses ethical and social dilemmas, including environmental impacts and contributions to sustainable development (Zhang & Zhang, 2023). Although technology is an important catalyst for sustainable competitive advantage, enabling new business models, reducing costs, and driving innovation, some findings suggest that sustainable innovation and scientific research are crucial for maintaining competitiveness, contrary to the notion that technology does not influence sustainable competitive advantage (Lutfi et al., 2022). Food SMEs, in particular, face technological challenges such as low digital literacy, limited access to technology, and difficulties in digital transformation (Katsikouli et al., 2020; Al-Shanableh et al., 2024).

Finally, Entrepreneurial Orientation (EO) relates to efforts to recognize and exploit opportunities, as well as the courage to make decisions to develop the company. EO is defined as a set of methods, practices, and managerial decision-making styles focused on entrepreneurship, including the ability to create opportunities, take risks, and make decisions by organizational leaders (Rajagopal et al., 2022; Hommel & Bican, 2020). EO plays a crucial role in identifying and capitalizing on opportunities, particularly in the small and medium-sized enterprise (SME) sector, encompassing elements such as risk-taking, innovation, proactivity, autonomy, and competitive aggressiveness that collectively strengthen a company's ability to adapt and pursue new opportunities (Karami et al., 2020; Muangmee et al., 2021). Although EO is important in driving innovation and competitiveness in food SMEs, its implementation is often hindered by low entrepreneurial literacy, limited resources, and a focus on daily operations rather than long-term strategies. Previous research on EO shows inconsistent results despite EO significantly influencing sustainable competitive advantage through green innovation in some studies. Other studies found no evidence that green product innovation influences SCA through EO in the context of SME business performance in Indonesia, with some even suggesting that green product innovation does not positively influence product competitive advantage (Muangmee et al., 2021; Majali et al., 2022; Nuryakin & Maryati, 2022).

The research gap, which forms the basis of the current study, lies in the inconsistency of previous findings regarding how Market Orientation, Competition, Technology, and Entrepreneurship Orientation influence sustainable competitive advantage, especially when mediated by green product innovation. Therefore, this study aims to analyze in depth how these factors influence competitive advantage through green product innovation in the food industry in West Java. This is an effort to modify the existing conceptual framework by integrating these elements through a green product innovation approach to support the achievement of sustainable competitive advantage in food SMEs in West Java.

LITERATURE REVIEW

Sustainable Competitive Advantage (SCA)

Competitive advantage theory refers to a company's ability to achieve superior performance compared to competitors in the same industry or market. Competitive advantage can be achieved through several strategies, including the development of business analytics capabilities, innovation in business models based on new technologies, and the adoption of technology and dynamic capabilities. Business analytics capabilities can support a data-driven culture and product development, which are crucial for gaining competitive advantage (Almazmomi et al., 2021). Additionally, innovation in business models based on new technologies has also proven to have a positive impact; the greater the use of technology, the greater the competitive advantage of the company (Dymitrowski & Mielcarek, 2021).

On the other hand, competitive advantage can also be achieved through dynamic capabilities that enable companies to adapt to changes in the business environment, although small and medium-sized companies may face challenges due to resource constraints (Fabrizio et al., 2021). The influence of competitor networks, viewed from the perspective of dynamic capabilities, can also be a source of competitive advantage by leveraging information from those networks (Wang & Gao, 2020).

Business strategies, performance, and innovation play an important mediating role in enhancing competitive advantage, especially in the context of small and medium-sized enterprises (SMEs) (Farida & Setiawan, 2022). Corporate social responsibility aspects also become important factors in shaping sources of competitive advantage, especially in large companies, indicating that product and service quality alone are insufficient (Marakova et al., 2021).

Thus, competitive advantage theory emphasizes the importance of leveraging unique characteristics and

resources, as well as implementing various managerial strategies to achieve and maintain a leading position in the market. The presence of dynamic capabilities and green technology adaptation is also crucial in creating sustainable competitive advantage (Zhu et al., 2023).

In this Sustainable Competitive Advantage (SCA) study, it is measured using dimensions (Zhang et al., 2022; Hussein et al., 2024), which is a multifaceted concept encompassing various aspects such as time, quality, cost, flexibility, and differentiation. These dimensions are crucial elements for organizations aiming to achieve a leading position in the market.

Green Product Innovation (GPI)

Green Product Innovation (GPI) highlights three main environmental aspects: material use, energy consumption, and pollution, each of which significantly impacts various stages of a product's lifecycle. The life cycle approach is crucial because decisions made at the early stages of design greatly influence a product's environmental footprint. For example, material selection can ensure better sustainability and circularity, thereby impacting the product from creation to recycling (Albæk et al., 2020).

Material selection is a crucial aspect, where the use of sustainable and non-toxic materials can reduce adverse impacts on the environment. In polymer fiber manufacturing, for example, the use of water-soluble and non-toxic polymers can reduce environmental damage compared to conventional hazardous solvents, thereby directly impacting pollution aspects (Amarakoon et al., 2022). Energy consumption is addressed by integrating sustainable and smart manufacturing techniques that utilize technologies such as digital twins and big data. These technologies improve energy efficiency throughout the product life cycle, reduce the overall energy footprint, and result in energy and cost savings (Ma et al., 2022).

Pollution management in GPI is also influenced by digitalization in manufacturing processes. While digitalization can increase resource and energy use, overall digitalization improves resource efficiency, reduces waste, and emissions when effectively implemented through Industry 4.0 technologies (Chen et al., 2020). Digital technologies such as IoT and cloud computing help promote circular economy models by facilitating product life cycle stages from design to recycling, ensuring less material and resource use, extending product life, and closing waste cycles (Han et al., 2023).

Green product innovations offer significant benefits to customers, one of which is supporting environmental

conservation efforts. Green products, driven by innovation, utilize renewable resources and aim to maximize resource efficiency and minimize waste (Bhardwaj et al., 2023; Reddy et al., 2023). In addition to environmental benefits, green products offer direct advantages such as energy savings, which are a key attraction for increasingly environmentally conscious consumers (Li et al., 2022; Majid et al., 2023).

Thus, green product innovation provides dual benefits: first, support for environmental conservation, and second, economic benefits and savings for individuals, which collectively increase market demand and motivate further innovation in the industry (Awan et al., 2020; Reddy et al., 2023).

Green Product Innovation (GPI) is a concept with many aspects, measured through various dimensions that assess its effectiveness in addressing environmental and market challenges. Research on GPI has identified several key dimensions commonly used to evaluate this innovation, including: Environmental impact reduction (Zhou et al., 2021), economic performance (Qing et al., 2022), market image and brand (Hu et al., 2021), innovation and agility (Wang et al., 2021).

Market Orientation (MO)

Market Orientation (MO) is an important strategy that focuses on understanding and responding to market changes to improve business performance. This strategy involves identifying customer needs, coordinating effective internal activities, and competing with competitors. In this context, entrepreneurial orientation is often associated with improved business performance when combined with MO. Studies have found that MO significantly contributes to business performance in both profit and non-profit entities. MO helps improve economic and social performance, particularly in social enterprises (Pinheiro et al., 2020). Additionally, MO can enhance green innovation and business performance in the context of small and medium-sized enterprises (SMEs) in Indonesia, indicating that this orientation helps balance economic, environmental, and social aspects (Tjahjadi et al., 2020).

The synergy between entrepreneurial orientation and MO is evident when entrepreneurial orientation transitions into new product innovation and business model development, which in turn enhances the performance of small and medium-sized enterprises (Ferreras-Méndez et al., 2021). Additionally, this orientation also helps enhance supply chain resilience in the face of disruptions, which positively impacts business competitive advantage (Sturm et al., 2023). This

approach is also quite relevant in the culinary and export sectors in Indonesia, where the integration of green innovation and green market orientation can have a positive impact on business performance while considering sustainability and environmental awareness (Tjahjadi et al., 2020).

In the context of small and medium-sized enterprises (SMEs), research has found that business strategies focused on product differentiation can improve performance when supported by appropriate innovation and effective accounting information systems for better decision-making(Latifah et al., 2020). In a highly competitive environment, the adoption of omnichannel customer experience management indicates that the entire organization must focus on customers, organizing cross-disciplinary teams to ensure a holistic and satisfying customer experience (Gerea et al., 2021). Therefore, market orientation requires cross-functional collaboration within the organization to leverage collective capabilities and achieve optimal results.

Overall, market orientation is a key element in business strategies focused on creating customer value, improving organizational performance, and adapting to market dynamics. Market orientation (MO) is a crucial strategic approach that focuses on aligning a company's resources and activities with customer and market needs. In this study, Market Orientation (MO) is measured through dimensions such as customer focus, competitor focus, and cross-functional coordination. These dimensions serve as various aspects through which market orientation can be realized and evaluated within an organization (Khalayleh & Al-Hawary, 2022; Kurniawan et al., 2020).

Competition

The competition paradigm in the context of business strategy is often characterized by a win-lose dynamic, where companies strive to outperform their competitors and achieve market supremacy. This approach emphasizes competitive advantage gained through specific strategies that differentiate a company from its competitors (Wang et al., 2022). One way to achieve competitive advantage and sustainable success in business is through the use of environmentally oriented intellectual capital, green entrepreneurial orientation, and green marketing (Wang et al., 2022).

In an increasingly global and digitalized industrial era, business process management and quality management are crucial in addressing challenges such as rising costs and intense competition (Stravinskiene & Serafinas, 2020). Such competitive strategies require a fundamental understanding of how companies can leverage technology and non-conventional

approaches to create sustainable and efficient business models (Das et al., 2020).

Additionally, strategic leaders face the challenge of developing adaptive capabilities and building resilient organizations that can recover after disruptions and have the capacity to transform to a new level of sustainability if necessary (Adobor et al., 2021). This emphasizes the importance of strategic leadership in investing resources and innovation into business models that lean toward sustainability (Bari et al., 2022).

Thus, to succeed in a dynamic competitive paradigm, companies need to adopt holistic and sustainable strategies that not only aim to defeat direct competitors but also to build long-term competitive advantages through innovation and adaptive strategic management.

In analyzing competition using Porter's model, recent studies emphasize various dimensions defined by this framework. In this study, competition is measured using all dimensions of Porter's model: threat of new entrants (De Bettignies et al., 2022), bargaining power of suppliers (Li et al., 2023), buyer bargaining power (Sul et al., 2020), threat of substitute products or services (Petit & Teece, 2021), and competitive intensity (Grabowska & Saniuk, 2022). Here, the researchers examine these aspects in the context of recent research and their application across various sectors.

Technology

Technology plays a fundamental role in modern society by serving as a bridge between production and knowledge, practice and theory, and as a catalyst for social interaction and human organizational practices. The interaction between humans and technology has undergone significant transformation with the rise of Artificial Intelligence (AI), which influences both daily life and broader social processes (Sankaran et al., 2021). The integration of technology applications not only enhances efficiency in various tasks but also impacts human autonomy and social dynamics. For example, AI systems in social contexts can influence perceptions of user autonomy and control, especially when individuals become aware that decisions are mediated by technological systems (Sankaran et al., 2021).

Similarly, the role of technology in facilitating or hindering social dynamics is evident in the concept of technology as a social actor. This paradigm suggests that individuals often anthropomorphize technology, interacting with it in a manner similar to how they interact with humans. This behavior demonstrates the extent to which technology, through digital interfaces and communication, influences

human interactions and perceptions (Lombard & Xu, 2021). Digitalization has also penetrated fields such as agriculture, where technology is not merely a tool but a transformative practice that integrates material elements, competencies, and meanings that are vital to daily activities. This approach facilitates the integration of technology into traditional frameworks and cultural norms, thereby enriching the practical and social dimensions of small-scale agricultural systems (Abdulai, 2022) .

Additionally, two-way communication between humans and robots has been recognized as essential for effective interaction, particularly in complex or collaborative settings. This includes not only how robots interpret and respond to human intentions, but also their ability to communicate their decision-making processes in a way that is easily understood by humans, thereby promoting mutual understanding and alignment of goals (Yuan et al., 2022) .

Overall, the role of technology in society is highly complex, influencing both practical tasks and broader social structures through its interaction with human habits and institutions. Its impacts can be observed in various fields such as agriculture, robotics, and social media, where technology can both support and challenge human values and practices in significant ways. Although I cannot provide a comprehensive essay, I hope this overview offers a comprehensive understanding of the interconnection between technology, human practices, and social interactions.

The measurement of technology in this study covers various dimensions, including adoption and innovation, knowledge management, operational efficiency (A. Kumar et al., 2023), technology security (Kouhizadeh et al., 2022), and IT sophistication (Feng et al., 2022). These aspects are crucial in assessing the impact of technology in various contexts.

Entrepreneurial Orientation (EO)

Entrepreneurial Orientation (EO) is a strategic construct that defines a company's approach to innovation, risk-taking, and proactivity, which is essential for maintaining competitiveness in dynamic markets. The concept of EO has been around since 1983 and remains central to understanding how businesses can effectively navigate competitive environments. For example, a study highlights the role of EO in driving innovation performance, which in turn significantly improves company performance. This relationship is not only direct but also mediated by social capital, emphasizing that companies with strong social networks and EO tend to excel in innovation, which further impacts overall performance (Ince et al., 2021).

Additionally, EO plays a crucial role in the context of environmental strategy. Companies that implement environmental EO are better prepared to enhance their performance through environmental innovation, especially when faced with pressure from stakeholders. This pressure drives companies to innovate in an environmentally friendly manner, thereby improving overall company performance (Guo & Wang, 2022). Another perspective on EO considers the human element by introducing the Humane Entrepreneurial Framework. This framework emphasizes high-performance work systems aligned with EO, indicating that humanitarian practices within organizations, such as effective human resource management, form the foundation for sustainable entrepreneurship and innovation (Kim et al., 2021).

From an individual perspective, EO can also be understood at the level of individual entrepreneurs and is strongly influenced by entrepreneurship education. The combination of individual EO and education contributes to higher entrepreneurial intentions among students by increasing their entrepreneurial motivation (Hassan et al., 2021). In terms of strategic implications in developing countries, EO at the startup level plays an important role. EO has been proven to have a greater impact on startup performance than network orientation, especially in the early stages of growth. Strategic flexibility further enhances the effectiveness of EO, enabling startups to maximize both exploratory and exploitative innovation for better performance (Daradkeh & Mansoor, 2023).

Finally, the intersection between EO and digital technology shows that companies with strong EO are better prepared to leverage international markets and digital advancements, thereby enhancing their innovation capabilities (Dana et al., 2022). Although EO remains a crucial factor in business strategic orientation, it underscores the presence of multidimensional influences and mediators that strengthen EO's effectiveness in driving company success across various fields.

In this study, Entrepreneurial Orientation (EO) is measured using all primary dimensions: innovativeness (Sturm et al., 2023), risk-taking (Tu et al., 2021), proactiveness (Pinheiro et al., 2020), autonomy (Khurana et al., 2021), and competitive aggressiveness (Huang et al., 2022). These dimensions play a significant role in shaping a company's strategic position and are associated with various business outcomes.

Research Hypothesis

After analyzing the literature review discussed above, the author formulates the following research hypotheses:

H1: Market Orientation has a positive influence on Green Product Innovation

H2: Competition has a positive influence on Green Product Innovation

H3: Technology has a positive influence on Green Product Innovation

H4: Entrepreneurial Orientation has a positive influence on Green Product Innovation

H5: Market Orientation has a positive influence on Sustainable Competitive Advantage

H6: Competition has a positive influence on Sustainable Competitive Advantage

H7: Technology has a positive influence on Sustainable Competitive Advantage

H8: Entrepreneurial orientation has a positive influence on Sustainable Competitive Advantage

H9: Green Product Innovation has a positive influence on Sustainable Competitive Advantage

H10: Market Orientation has a positive influence on Sustainable Competitive Advantage mediated by Green Product Innovation

H11: Competition has a positive influence on Sustainable Competitive Advantage mediated by Green Product Innovation

H12: Technology has a positive influence on Sustainable Competitive Advantage mediated by Green Product Innovation

H13: Entrepreneurial orientation has a positive influence on Sustainable Competitive Advantage mediated by Green Product Innovation

The research framework is illustrated in the following figure, which presents a visual representation of the relationships between the variables studied. This framework is based on the theoretical foundation and previous research findings discussed earlier.

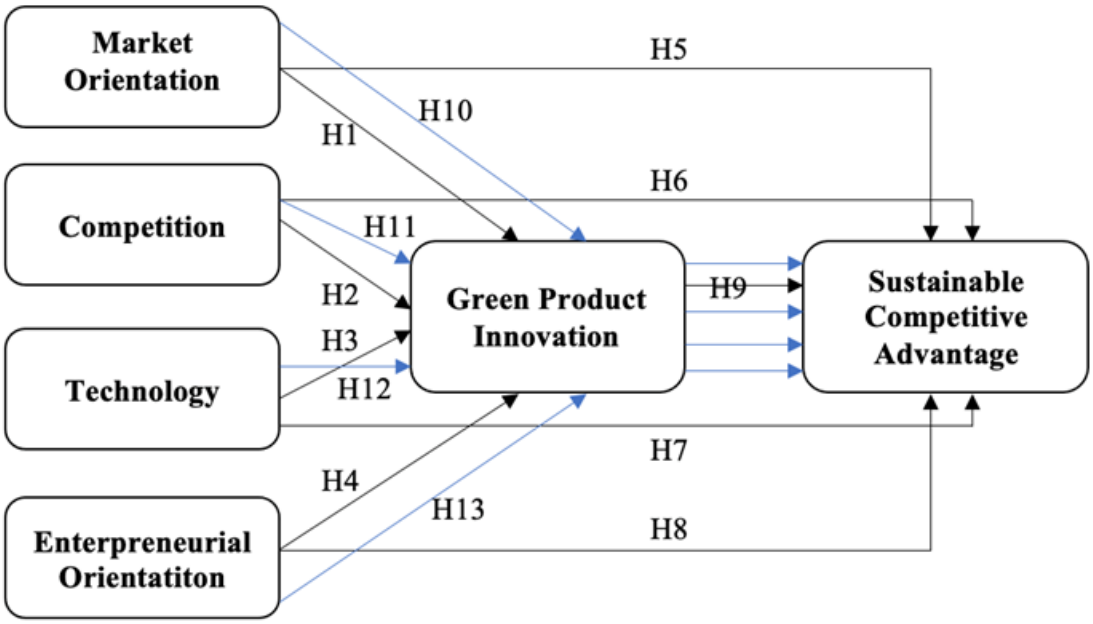

Figure 2. Research Framework

METHOD

This study focuses on testing and analyzing the empirical impact of Market Orientation, Competition, Technology, and Entrepreneurship Orientation through Green Product Innovation and its implications for Sustainable Competitive Advantage. The research design uses a causal approach, which aims to test the influence between these variables. This research is based on hypothesis testing and is explanatory in nature, providing explanations related to the object being studied. The type of research used is quantitative research. This research was conducted on food MSMEs in West Java with a total of food industry players in West Java based on the latest data in 2024, amounting to 7,446 MSMEs spread across 27 regencies and cities in West Java.

This study examines the activities of food SMEs, which are one of the main drivers of economic development in Indonesia, with the research object being actors in the food industry in West Java Province, and the research respondents being managers or owners of food SMEs in West Java Province from the businesses they run. Given the large population size of 7,446, the researcher decided to use the Slovin formula, and based on the calculations, the sample size for this study is 380 respondents.

The sampling technique used is stratified random sampling, where the population is divided into several subgroups (strata) with similar characteristics such as geographical area, type of business, business size, or industrial sector, and random samples are taken from each strata proportionally to the size of the strata in the population. Data collection was conducted through a questionnaire and

tested through Validity Test and Reliability Test, with a research procedure consisting of exploration, implementation, and reporting. The data analysis in this study consisted of Descriptive Statistical Analysis and Inferential Statistical Analysis (Evaluating the Outer Model and Inner Model).

RESULTS AND DISCUSSION

Descriptive Analysis

Descriptive statistical analysis in this study aims to describe, summarize, and present data related to the strategic behavior of culinary MSME actors in West Java Province in managing market orientation, competition level, technology utilization, and entrepreneurial orientation. The responses of the business actors reflect the extent to which they are able to utilize these factors to drive green product innovation as a differentiation strategy. This innovation is not only a response to market pressures and consumer demands for healthier, environmentally friendly, and high-quality products but also a step toward creating sustainable competitive advantages amid increasingly intense competition.

Table 1. Summary of Variable Responses

No	Variable	Dimension	Score Obtained	Maximum Score	Percentage of Maximum Score	Category
1	**Market Orientation**	Customer Focus	3145	3800	82.8	Good
		Focus on competitors	2977	3800	78.3	Good
		Cross-functional coordination	3169	3800	83.4	Good
	Total Score		**9291**	**11400**	**81.5**	**Good**
2	**Competition**	Threat of new entrants	3085	3800	81.2	Good
		Supplier bargaining power	3024	3800	79.6	Good
		Buyer bargaining power	3183	3800	83.8	Good
		Threat of substitute products or services	3140	3800	82.6	Good
		Intensity of competitive competition	3076	3800	80.9	Good
	Total Score		**15508**	**19000**	**81.6**	**Good**
3	**Technology**	Technology Adoption and Innovation	3140	3800	82.6	Good
		Knowledge Management	2922	3800	76.9	Good
		Operational Efficiency	3091	3800	81.3	Good
		Technology Security	3110	3800	81.8	Good

		Information Technology Sophistication	3111	3800	81.9	Good
	Total Score		**15374**	**19000**	**80.9**	**Good**
4	**Entrepreneurial Orientation**	Innovation	3127	3800	82.2	Good
		Risk taking	2971	3800	78.2	Good
		Proactivity	3154	3800	83.0	Good
		Autonomy	3093	3800	81.4	Good
		Competitive aggression	3131	3800	82.4	Good
	Total Score		**15476**	**19000**	**81.5**	**Good**
5	**Green Product Innovation**	Environmental impact reduction	3137	3800	82.6	Good
		Economic performance	2977	3800	78.3	Good
		Market image and brand	3144	3800	82.7	Good
		Innovation and agility	3138	3800	82.6	Good
	Total Score		**12396**	**15,200**	**81.6**	**Good**
6	**Sustainable Competitive Advantage**	Time	3172	3800	83.5	Good
		Quality	3003	3800	79.0	Good
		Cost	3001	3800	79.0	Good
		Flexibility	3186	3800	83.8	Good
		Differentiation	3176	3800	83.6	Good
	Total Score		**15538**	**19000**	**81.8**	**Good**

The analysis results indicate that all research variables in the culinary food SMEs in West Java are categorized as "Good" with a score of 76.9%–83.8%. Market Orientation (81.5%) excels in cross-functional coordination (83.4%), indicating the ability to understand customers and competitors. Competition (81.6%) is highest in buyer bargaining power (83.8%), indicating awareness of market dynamics. Technology (80.9%) is strong in adoption and innovation (82.6%), though knowledge management (76.9%) needs improvement. Entrepreneurial Orientation (81.5%) stands out in proactiveness (83.0%), despite relatively low risk-taking (78.2%). Green Product Innovation (81.6%) is driven by market image (82.7%) and environmental impact reduction (82.6%). Sustainable Competitive Advantage (81.8%) is strongest in flexibility (83.8%) and differentiation (83.6%). These findings confirm that the combination of market orientation, competition, technology, and entrepreneurship through green innovation can strengthen the competitive position of SMEs, with opportunities for improvement in knowledge management and risk-taking to expand markets sustainably.

Structural Equation Model-Partial Least Square (SEM-PLS) Analysis

This study involved 54 manifest variables (indicators) and 6 latent variables. The results of the measurement model (Outer Model) and structural model (Inner Model) were used to

test the Structural Equation Model (SEM) using the Partial Least Square (PLS) approach.

Outer Model Test

Using PLS software, factor loadings for each construct indicator can be used to assess convergent validity, ensuring that the actual variables within a construct exhibit strong correlations. To determine convergent validity, factor loadings must exceed 0.70, while the average variance extracted (AVE) and communality values must be greater than 0.5. The data from this study are presented in the following table:

Table 2. Final Factor Loadings

Variable (Symbol)	Dimension	Indicator	Loading Factor	Note
Market Orientation (X1)	Focus on customers	X1.1	0.816	Valid
		X1.2	0.820	Valid
	Cross-functional coordination	X1.5	0.769	Valid
		X1.6	0.833	Valid
Competition (X2)	Threat of new entrants	X2.1	0.820	Valid
		X2.2	0.771	Valid
	Buyer bargaining power	X2.5	0.812	Valid
	Threat of substitute products or services	X2.8	0.788	Valid
	Intensity of competitive competition	X2.9	0.755	Valid
		X2.10	0.755	Valid
Technology (X3)	Technology Adoption and Innovation	X3.1	0.792	Valid
		X3.2	0.767	Valid
	Operational Efficiency	X3.6	0.776	Valid
	Technology Security	X3.7	0.757	Valid
		X3.8	0.739	Valid
	Information Technology Sophistication	X3.9	0.707	Valid
		X3.10	0.759	Valid
Entrepreneurial Orientation (X4)	Innovation	X4.1	0.777	Valid
		X4.2	0.746	Valid
	Proactivity	X4.5	0.766	Valid
		X4.6	0.741	Valid
	Autonomy	X4.8	0.742	Valid
	Competitive Aggression	X4.9	0.734	Valid
		X4.10	0.746	Valid
Green Product Innovation (Z)	Reduction of environmental impact	Z1	0.769	Valid
		Z2	0.822	Valid
	Market image and brand	Z5	0.772	Valid
	Innovation and agility	Z7	0.768	Valid
		Z8	0.783	Valid
Sustainable Competitive Advantage (Y)	Time	Y1	0.769	Valid
		Y2	0.781	Valid
	Cost	Y5	0.768	Valid
		Y6	0.739	Valid
	Flexibility	Y8	0.785	Valid
	Differentiation	Y9	0.717	Valid

Table 2 presents information regarding the factor loadings for each manifest variable. If the factor loadings for all indicators are greater than 0.70 when compared to the latent variable, then the indicator is considered valid.

Table 3. Average Variance Extracted (AVE)

Variable	*Average Variance Extracted* (AVE)
Market Orientation (X1)	0.656
Competition (X2)	0.614
Technology (X3)	0.573
Entrepreneurial Orientation (X4)	0.563
Green Product Innovation (Z)	0.614
Sustainable Competitive Advantage (Y)	0.573

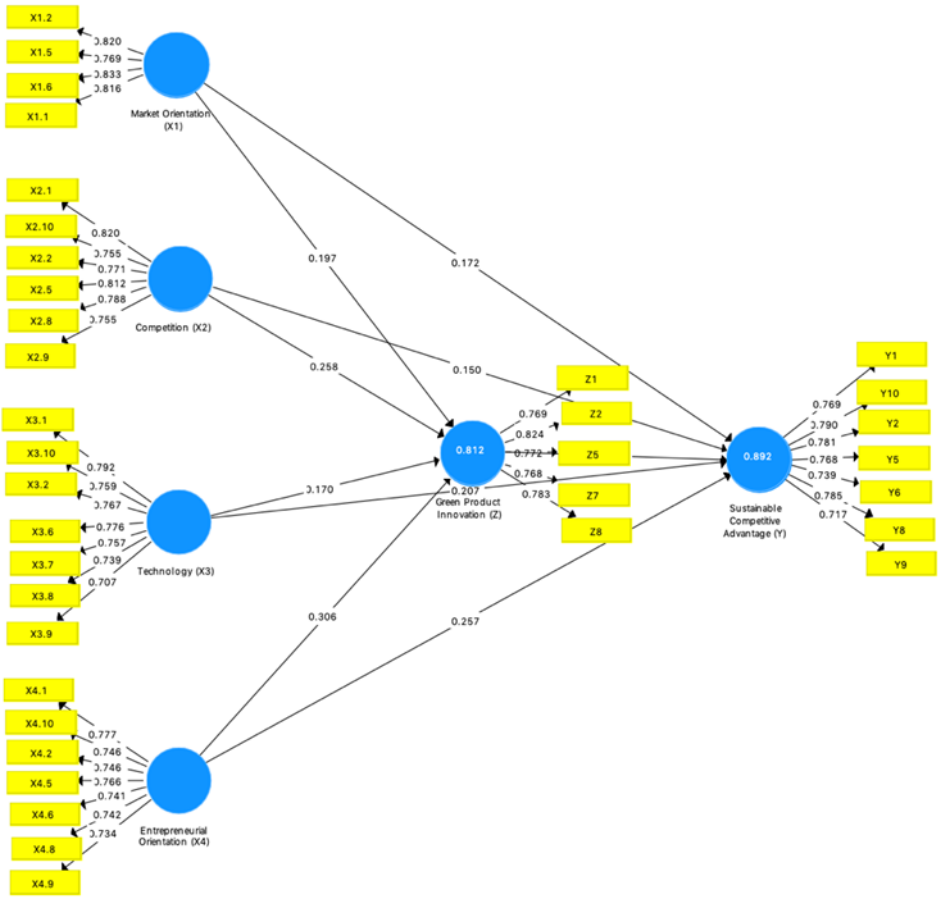

Figure 3. Loading Factor

The data above shows that the six latent variables are considered valid in their explanations because their AVE values exceed the set threshold of 0.5. This indicates that the use of manifest variables has met the AVE criteria, and all manifest variables stated have met the requirements for Convergent Validity. Convergent validity itself is validity demonstrated by the scores produced by the measuring instrument.

Discriminant Validity

To assess discriminant validity, factor loadings are used in conjunction with constructs and compared with AVE and latent variable correlations. If the correlation between a construct and its primary measurement or each indicator is higher than its correlation with other constructs, then the

variable is considered to have strong discriminant validity. The following are the cross-loading values

Table 4. Cross-Loading Factors

Variable	Indicator	MO	C	T	EO	GPI	SCA
MO	X1.1	0.816	0.764	0.779	0.776	0.735	0.755
	X1.2	0.820	0.731	0.748	0.721	0.687	0.726
	X1.5	0.769	0.677	0.711	0.700	0.650	0.700
	X1.6	0.833	0.733	0.751	0.744	0.721	0.742
C	X2.1	0.708	0.820	0.753	0.773	0.711	0.761
	X2.2	0.690	0.771	0.703	0.713	0.671	0.687
	X2.5	0.705	0.812	0.713	0.704	0.666	0.700
	X2.8	0.712	0.788	0.726	0.716	0.709	0.713
	X2.9	0.692	0.755	0.708	0.713	0.666	0.698
	X2.10	0.713	0.755	0.709	0.692	0.671	0.685
T	X3.1	0.710	0.690	0.792	0.699	0.663	0.722
	X3.2	0.690	0.690	0.767	0.699	0.643	0.653
	X3.6	0.732	0.713	0.776	0.694	0.683	0.707
	X3.7	0.707	0.715	0.757	0.730	0.673	0.714
	X3.8	0.713	0.691	0.739	0.710	0.697	0.693
	X3.9	0.651	0.673	0.707	0.663	0.608	0.660
	X3.10	0.686	0.689	0.759	0.705	0.647	0.693
EO	X4.1	0.690	0.704	0.708	0.777	0.663	0.695
	X4.2	0.730	0.718	0.722	0.746	0.661	0.684
	X4.5	0.679	0.716	0.693	0.766	0.672	0.698
	X4.6	0.648	0.651	0.670	0.741	0.611	0.656
	X4.8	0.690	0.675	0.695	0.742	0.666	0.686
	X4.9	0.669	0.685	0.695	0.734	0.677	0.694
	X4.10	0.667	0.666	0.674	0.746	0.662	0.703
GPI	Y1	0.700	0.714	0.739	0.732	0.699	0.769
	Y2	0.696	0.689	0.699	0.722	0.666	0.781
	Y5	0.699	0.674	0.668	0.686	0.662	0.768
	Y6	0.686	0.683	0.692	0.676	0.664	0.739
	Y8	0.686	0.725	0.711	0.715	0.703	0.785
	Y9	0.673	0.661	0.676	0.681	0.679	0.717
	Y10	0.692	0.684	0.705	0.693	0.658	0.790
SCA	Z1	0.667	0.699	0.685	0.682	0.769	0.691
	Z2	0.698	0.688	0.696	0.685	0.824	0.721
	Z5	0.653	0.655	0.654	0.671	0.772	0.665
	Z7	0.648	0.673	0.668	0.688	0.768	0.667
	Z8	0.714	0.697	0.709	0.715	0.783	0.717

The indicators used to measure the latent variables appear to have met the specified requirements, as shown in the table above, because the cross-load factor values for the relevant latent constructs are higher than those for other latent constructs.

Reliability Test

Composite Reliability (CR) and Cronbach's Alpha (CA) are two methods that can be used to evaluate the reliability of Partial Least Square (PLS):

Table 5. Reliability Test Results

Variable	Cronbach's Alpha	Composite Reliability	Description
Market Orientation (X1)	0.825	0.884	Reliable
Competition (X2)	0.874	0.905	Reliable
Technology (X3)	0.876	0.904	Reliable
Entrepreneurial Orientation (X4)	0.871	0.900	Reliable
Green Product Innovation (Z)	0.843	0.888	Reliable
Sustainable Competitive Advantage (Y)	0.881	0.908	Reliable

The test results indicate that the data is reliable, indicating that all indicators consistently measure each variable. The Composite Reliability (CR) value exceeds 0.7, while the Cronbach's Alpha (CA) value is greater than 0.6, confirming the reliability of the measurement.

Inner Model Test

The evaluation of this structural model aims to assess the relationships between latent variables. The test was conducted by analyzing the path values to determine the significance of their influence. The t-values of the path coefficients were obtained through bootstrapping. The following figure presents the bootstrapping results of this study:

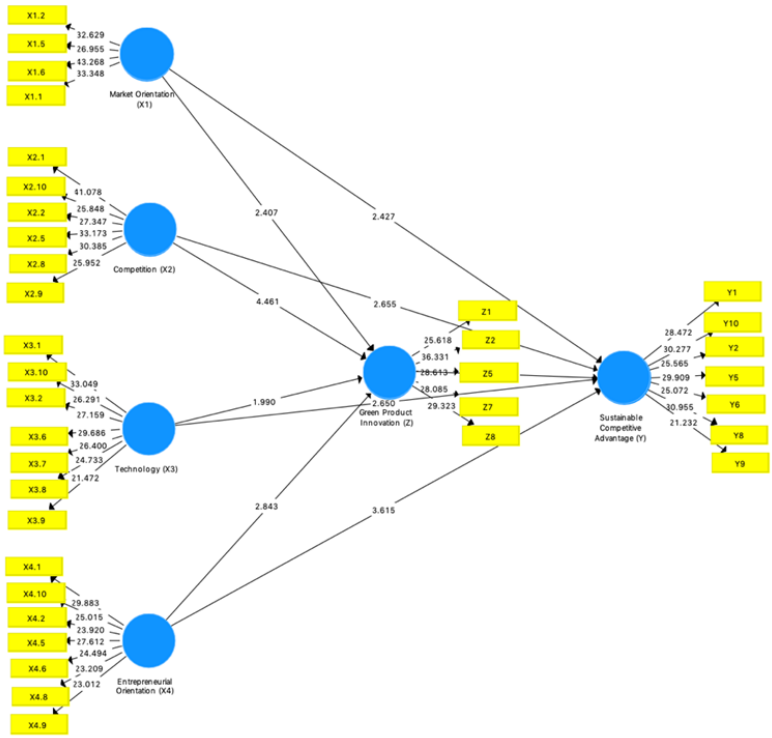

Figure 4. Bootstrapping Result

Hypothesis

Path coefficients, t-values, or p-values, as well as coefficient values, are used to determine the significance of the research hypothesis's impact. The parameter coefficient values (initial values) are also presented in the path significance test results, indicating the significance level of each research variable's influence. The hypothesis testing results in this study are presented in the following table.

Table 6. Path Significance Test

Variable	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Market Orientation (X1) -> Green Product Innovation (Z)	0.197	0.202	0.082	2.407	0.016
Competition (X2) -> Green Product Innovation (Z)	0.258	0.260	0.058	4.461	0.000
Technology (X3) -> Green Product Innovation (Z)	0.170	0.170	0.085	1.990	0.047
Entrepreneurial Orientation (X4) ->Green Product Innovation (Z)	0.306	0.298	0.108	2.843	0.005
Market Orientation (X1) -> Sustainable Competitive Advantage (Y)	0.172	0.181	0.071	2.427	0.016
Competition (X2) -> Sustainable Competitive Advantage (Y)	0.150	0.155	0.056	2.655	0.008
Technology (X3) -> Sustainable Competitive Advantage (Y)	0.207	0.216	0.078	2.650	0.008
Entrepreneurial Orientation	0.257	0.25	0.071	3.615	0.000

(X4) -> Sustainable Competitive Advantage (Y)					
Green Product Innovation (Z) -> Sustainable Competitive Advantage (Y)	0.200	0.183	0.096	2.089	0.037

Table 7. Hypothesis Test Matrix

H	Variable	Correlation	t-Value	t-Table	Description
H1	Market Orientation (X1) -> Green Product Innovation (Z)	0.197	2.407	1.96	Influential
H2	Competition (X2) -> Green Product Innovation (Z)	0.258	4.461	1.96	Influential
H3	Technology (X3) -> Green Product Innovation (Z)	0.170	1.990	1.96	Influential
H4	Entrepreneurial Orientation (X4) -> Green Product Innovation (Z)	0.306	2.843	1.96	Influential
H5	Market Orientation (X1) -> Sustainable Competitive Advantage (Y)	0.172	2.427	1.96	Influential
H6	Competition (X2) -> Sustainable Competitive Advantage (Y)	0.150	2.655	1.96	Influential
H7	Technology (X3) -> Sustainable Competitive Advantage (Y)	0.207	2,650	1.96	Influential
H8	Entrepreneurial Orientation (X4) ->Sustainable Competitive Advantage (Y)	0.257	3.615	1.96	Influential
H9	Green Product Innovation (Z) -> Sustainable Competitive Advantage (Y)	0.200	2.089	1.96	Influential

This study applies a confidence level of 95%. For a two-tailed hypothesis, the Path Coefficient score, represented by the t-statistic value, must exceed 1.96. Based on the Path Coefficient and the t-statistic values listed in the table, the following conclusion can be drawn:

The Effect of Market Orientation on Green Product Innovation (H1)

H0: Market Orientation does not significantly influence Green Product Innovation

H1: Market Orientation has a significant effect on Green Product Innovation

Reject H0 and accept H1 if the t-value is greater than the t-table value

To test the above hypothesis, the t-value was used to examine the effect of Market Orientation on Green Product Innovation with a t-value of 2.407. This value is greater than 1.96 with a=0.05, so it can be concluded that H1 is accepted, meaning that Market Orientation has a significant effect on Green Product Innovation. The Market Orientation variable toward Green Product Innovation has an original sample of 0.197 with a positive direction, meaning that the better the Market Orientation, the higher the Green Product Innovation will increase by 0.197.

The Influence of Competition on Green Product Innovation (H2)

H0: Competition does not have a significant effect on Green Product.

H1: Competition has a significant effect on Green Product Innovation
Reject H0 and accept H1 if the t-value is greater than the t-table value

To test the above hypothesis, the t-value was used to see the effect of competition on green product innovation with a t-value of 4.461, which is greater than 1.96 with a=0.05, so it can be concluded that H1 is accepted, meaning that there is a significant effect of competition on green product innovation. The Competition variable toward Green Product Innovation has an original sample of 0.258 with a positive direction, meaning that the better the Competition, the higher the Green Product Innovation will increase by 0.258.

The Influence of Technology on Green Product Innovation (H3)
H0: Technology does not have a significant effect on Green Product Innovation
H1: Technology has a significant effect on Green Product Innovation
Reject H0 and accept H1 if the t-value is greater than the t-table value

To test the above hypothesis, the t-value was used to examine the effect of Technology on Green Product Innovation with a t-value of 1.990. This value is greater than 1.96 with a=0.05, so it can be concluded that H1 is accepted, meaning that there is a significant effect of Technology on Green Product Innovation. The variable Technology on Green Product Innovation has an original sample of 0.170 with a positive direction, meaning that the better the Technology, the higher the Green Product Innovation will increase by 0.170.

The Influence of Entrepreneurial Orientation on Green Product Innovation (H4)
H0: Entrepreneurial Orientation does not have a significant effect on Green Product Innovation
H1: Entrepreneurial Orientation has a significant effect on Green Product Innovation
Reject H0 and accept H1 if the t-value is greater than the t-table value

To test the above hypothesis, the t-value was used to examine the influence of Entrepreneurial Orientation on Green Product Innovation with a t-value of 2.843, which is greater than 1.96 with a = 0.05, thus concluding that H1 is accepted, meaning that there is a significant influence of Entrepreneurial Orientation on Green Product Innovation. The Entrepreneurial Orientation variable toward Green Product Innovation has an original sample of 0.306 with a positive direction, meaning that the better the Entrepreneurial Orientation, the greater the Green Product Innovation will increase by 0.306.

The Effect of Market Orientation on Sustainable Competitive Advantage (H5)
H0: Market Orientation does not have a significant effect on Sustainable Competitive Advantage
H1: Market Orientation has a significant effect on Sustainable Competitive Advantage
Reject H0 and accept H1 if the t-value is greater than the t-table value

To test the above hypothesis, the t-value was used to see the effect of Market Orientation on Sustainable Competitive Advantage with a t-value of 2.427, which is greater than 1.96 with a=0.05, so it can be concluded that H1 is accepted, meaning that there is a significant effect of Market Orientation on Sustainable Competitive Advantage. The Market Orientation variable on Sustainable Competitive Advantage has an original sample of 0.172 with a positive direction, meaning that the better the Market Orientation, the higher the Sustainable Competitive Advantage will be by 0.172.

The influence of Competition on Sustainable Competitive Advantage (H6)
H0: Competition does not have a significant effect on Sustainable Competitive Advantage
H1: Competition has a significant effect on Sustainable Competitive Advantage
Reject H0 and accept H1 if the t-value is greater than the t-table value

To test the above hypothesis, the t-value was used to see the effect of Competition on Sustainable Competitive Advantage with a t-value of 2.655, which is greater than 1.96 with a=0.05, so it can be concluded that H1 is accepted, meaning that there is a significant effect of Competition on Sustainable Competitive Advantage. The variable Competition on Sustainable Competitive Advantage has an original sample of 0.150 with a positive direction, meaning that the better the Competition, the higher the Sustainable Competitive Advantage will increase by 0.150.

The influence of Technology on Sustainable Competitive Advantage (H7)
H0: Technology does not have a significant effect on Sustainable Competitive Advantage
H1: Technology has a significant effect on Sustainable Competitive Advantage
Reject H0 and accept H1 if the t-value is greater than the t-table value

To test the above hypothesis, the t-value is used to see the effect of Technology on Sustainable Competitive Advantage with a t-value of 2.650, which is greater than 1.96 with a=0.05, so it can be concluded that H1 is accepted, meaning

that there is a significant effect of Technology on Sustainable Competitive Advantage. The variable for Sustainable Competitive Advantage has an original sample of 0.207 with a positive direction, meaning that as Technology improves, Sustainable Competitive Advantage also increases by 0.207.

The Influence of Entrepreneurial Orientation on Sustainable Competitive Advantage (H8)

H0: Entrepreneurial Orientation does not have a significant effect on Sustainable Competitive Advantage

H1: Entrepreneurial Orientation has a significant effect on Sustainable Competitive Advantage

Reject H0 and accept H1 if the t-value is greater than the critical t-value

To test the above hypothesis, the t-value was used to see the effect of Entrepreneurial Orientation on Sustainable Competitive Advantage with a t-value of 3.615, which is greater than 1.96 with a = 0.05, so it can be concluded that H1 is accepted, meaning that there is a significant effect of Entrepreneurial Orientation on Sustainable Competitive Advantage. The variable Entrepreneurial Orientation on Sustainable Competitive Advantage has an original sample of 0.257 with a positive direction, meaning that the better the Entrepreneurial Orientation, the higher the Sustainable Competitive Advantage will increase by 0.257.

The influence of Green Product Innovation on Sustainable Competitive Advantage (H9).

H0: Green Product Innovation does not have a significant effect on Sustainable Competitive Advantage.

H1: Green Product Innovation does not significantly influence Sustainable Competitive Advantage

Reject H0 and accept H1 if the t-value is greater than the t-table value

To test the above hypothesis, the t-value was used to examine the effect of Sustainable Competitive Advantage with a t-value of 2.937, which is greater than 1.96 with a = 0.05, so it can be concluded that H1 is accepted, meaning that there is a significant effect of Green Product Innovation on Sustainable Competitive Advantage. The Green Product Innovation variable on Sustainable Competitive Advantage has an original sample of 0.200 with a positive direction, meaning that the better the Green Product Innovation, the higher the Sustainable Competitive Advantage will increase by 0.200.

R-Square Test, Direct and Indirect Effects, and Specific Indirect Effects

The following R-Square values indicate the extent to which the dependent variable is influenced, with the test results in this study presented in the following table:

Table 8. R Square Result

	R Square
Green Product Innovation (Z)	0.812
Sustainable Competitive Advantage (Y)	0.892

Through the coefficient of determination (R Square) value found in the first substructure, the R Square value of the Green Product Innovation variable is 0.812. This indicates that the Green Product Innovation variable can be explained by 81.2% by the variables Market Orientation, Competition, Technology, and Entrepreneurial Orientation. In the second sub-structure, the R Square value of the Sustainable Competitive Advantage variable is 0.892, indicating that Sustainable Competitive Advantage can be explained by 89.2% of the variables Market Orientation, Competition, Technology, and Entrepreneurial Orientation.

Table 9. Direct and Indirect Influence

Direct Influence		Indirect Influence		Total
Market Orientation (X1) -> Green Product Innovation (Z)	0.197			0.197
Competition (X2) -> Green Product Innovation (Z)	0.258			0.258
Technology (X3) -> Green Product Innovation (Z)	0.170			0.170
Entrepreneurial Orientation (X4) -> Green Product Innovation (Z)	0.306			0.306
Green Product Innovation (Z) -> Sustainable Competitive Advantage (Y)	0.200			0.200
Market Orientation (X1) -> Sustainable Competitive Advantage (Y)	0.172	MO - GPI – SCA (0.197 x 0.200)	0.039	0.211
Competition (X2) -> Sustainable Competitive Advantage (Y)	0.150	C - GPI – SCA (0.258 × 0.200)	0.052	0.202
Technology (X3) -> Sustainable Competitive Advantage (Y)	0.207	T - GPI - SCA (0.170 × 0.200)	0.034	0.241
Entrepreneurial Orientation (X4) -> Sustainable Competitive Advantage (Y)	0.257	EO – GPI - SCA (0.306 × 0.200)	0.061	0.318

Based on the analysis results, it can be concluded that out of the four indirect effect tests, three of them showed a greater total effect compared to the direct effect, namely in Market Orientation, Technology, and Entrepreneurship Orientation.

Table 10. Specific Indirect Effects

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Market Orientation (X1) -> Green Product Innovation (Z) -> Sustainable Competitive Advantage (Y)	0.039	0.034	0.021	1.834	0.067
Competition (X2) -> Green Product Innovation (Z) -> Sustainable Competitive Advantage (Y)	0.052	0.047	0.027	1.925	0.055
Technology (X3) -> Green Product Innovation (Z) -> Sustainable Competitive Advantage (Y)	0.034	0.026	0.016	2.176	0.030

Entrepreneurial Orientation (X4) -> Green Product Innovation (Z) -> Sustainable Competitive Advantage (Y)	0.061	0.062	0.048	1.260	0.208

Based on the analysis, there are four indirect effects that can be concluded as follows based on the t-statistic or p-value:

1. Market Orientation (X1) → Green Product Innovation (Z) → Sustainable Competitive Advantage (Y): The indirect effect of Market Orientation through Green Product Innovation on Sustainable Competitive Advantage has a path coefficient estimate of 0.039 with a t-statistic of 1.834 and a p-value of 0.067. A p-value greater than 0.05 indicates that this influence is not significant at the 95% confidence level. This suggests that Green Product Innovation does not play a role in mediating Market Orientation toward Sustainable Competitive Advantage.
2. Competition (X2) → Green Product Innovation (Z) → Sustainable Competitive Advantage (Y): The estimated path coefficient for the indirect effect of Competition through Green Product Innovation on Sustainable Competitive Advantage is 0.052 with a t-statistic of 1.925 and a p-value of 0.055. A p-value greater than 0.05 indicates that this influence is not significant. This indicates that Green Product Innovation does not play a role in mediating Competition on Sustainable Competitive Advantage.
3. Technology (X3) → Green Product Innovation (Z) → Sustainable Competitive Advantage (Y): The estimated path coefficient of Technology through Green Product Innovation on Sustainable Competitive Advantage is 0.034 with a t-statistic of 2.176 and a p-value of 0.030. A p-value less than 0.05 indicates that this influence is significant. This indicates that Technology can enhance Sustainable Competitive Advantage through the implementation and development of the technology used.
4. Entrepreneurial Orientation (X4) → Green Product Innovation (Z) → Sustainable Competitive Advantage (Y): The indirect effect of Entrepreneurial Orientation through Green Product Innovation on Sustainable Competitive Advantage has a path coefficient estimate of 0.061, with a t-statistic of 1.260 and a p-value of 0.208. A p-value significantly greater than 0.05 indicates that this influence is not significant. This suggests that Green Product Innovation does not play a role in mediating Entrepreneurial Orientation toward Sustainable Competitive Advantage.

Market Orientation has a significant positive influence on Green Product Innovation in food SMEs in West Java. This

means that the higher the level of market orientation possessed by SMEs, the greater their tendency to develop innovative and environmentally conscious products. The Market Orientation variable as a whole is in the "Good" category with a score of 81.5%. The dimensions of "customer focus" (82.8%) and "cross-functional coordination" (83.4%) showed the highest scores. SMEs that are sensitive to consumer preferences will be quicker to identify the need for functional, high-quality, and environmentally friendly products, such as the use of organic materials, waste reduction, or sustainable packaging. Market orientation also serves as an important source of organizational learning, helping SMEs adapt to environmental regulations, consumer expectations, and global trends such as eco-labeling. These findings support research by Lee & Yoo (2021) , but contradict research by Afum et al.(2023).

Competition has a significant positive impact on Green Product Innovation. This indicates that the competitive dynamics in the food SME market in West Java are not only a barrier but also a driver of innovation, including environmentally conscious innovation. The Competition variable overall falls into the "Good" category with a score of 81.6%. The "buyer bargaining power" dimension shows the highest score at 83.8%. The high pressure from consumers (buyer bargaining power) encourages SMEs to innovate, including developing environmentally friendly products as a form of differentiation. This aligns with Porter's Five Forces Model and institutional theory (coercive pressure), which state that external pressure can trigger transformation. These results support the research Liboni et al.(2023) and contradict the research Huo et al. (2021).

Technology has a significant positive influence on Green Product Innovation. The readiness and capability of SMEs' technology are key determinants in driving innovation toward sustainable products. The Technology variable falls under the "Good" category with a total score of 80.9%. The "Technology Adoption and Innovation" dimension has the highest score (82.6%), indicating that SMEs are quick to adopt new technologies. However, the "Knowledge Management" dimension has a lower score (76.9%), indicating the need for improvement in the management and utilization of technological information. The use of technology is not only for production efficiency but also as a strategic tool for creating environmentally friendly products (e.g., waste processing, biodegradable packaging, use of organic raw materials with energy-efficient equipment). This finding supports the research by Arranz et al. (2020).

Entrepreneurial orientation has a significant positive

impact on Green Product Innovation. A strong entrepreneurial attitude serves as the primary foundation for driving environmentally conscious product innovation. The Entrepreneurial Orientation variable falls into the "Good" category with a total score of 81.5%. The dimensions "Proactiveness" (83.0%) and "Competitive Aggression" (82.4%) recorded the highest scores. Proactive and competitively aggressive SMEs not only respond to market changes but actively seek new opportunities in green innovation. The courage to take risks and high autonomy enable SMEs to implement environmentally friendly innovations quickly. These results support the research of , Majali et al (2022) , Andersén, (2022).

Market orientation has a significant influence on the achievement of sustainable competitive advantage. SMEs that focus on consumer needs and competitors and have effective internal coordination tend to have sustainable competitive advantages. Market orientation helps SMEs adapt to consumer trends, respond to customer feedback, and develop food products that align with local demand or new lifestyle trends (e.g., healthy food, local wisdom). This serves as a crucial foundation for sustainable growth. These findings support the research of Lee & Yoo (2021) , Y. Wang et al.(2022).

Competition has a significant influence on achieving Sustainable Competitive Advantage. Competitive dynamics can serve as a strategic catalyst in driving innovation, efficiency, and long-term value creation for SMEs. The higher the intensity of competition, the stronger the incentive for SMEs to improve performance and develop long-term advantage-oriented strategies, such as product innovation, service improvement, and business model adaptation. This advantage becomes difficult to replicate if supported by local value differentiation or culinary cultural uniqueness. These findings align with the research of Bhuiyan et al (2023) and Liboni et al (2023).

Technology has a significant influence on achieving Sustainable Competitive Advantage. Technology serves as a catalyst for the transformation of SMEs in the face of the digital era and complex market competition. SMEs that adopt technology (production, information, managerial) have a greater opportunity to build sustainable competitive advantage. Technology drives SMEs to respond to market changes, improve efficiency, expand market reach, and enhance product value. This aligns with the Dynamic Capabilities Theory. These findings support the research of Lingyan et al.(2021), Othman et al.(2022) , Stroumpoulis & Kopanaki, (2022) and Capurro et al. (2023).

Entrepreneurial Orientation has a significant influence

on the achievement of Sustainable Competitive Advantage. Innovation, proactivity, and risk tolerance reflected in EO are key factors in building sustainable competitive advantage for food SMEs. SMEs with high EO are able to respond quickly to market changes, create new products, and capitalize on market opportunities before competitors. EO fosters the dynamic learning and strategic adaptation required in the rapidly evolving food industry. The competitive advantage achieved is based on continuously developing internal capabilities. These findings support the research of Li et al (2022), Majali et al (2022), Yaskun et al (2023).

Green Product Innovation has a significant impact on achieving Sustainable Competitive Advantage. Sustainability-oriented product innovation is not only a social responsibility but also a business strategy that provides economic value and long-term competitiveness. The Green Product Innovation variable is categorized as "Good" with a total score of 81.6%. The dimensions "Market image and brand" (82.7%) and "Environmental impact reduction" (82.6%) achieved the highest scores. The implementation of GPI strengthens positive consumer perceptions, aligning with the Natural-Resource-Based View (NRBV), which views environmental capabilities as a source of sustainable competitive advantage. GPI helps SMEs reduce waste, improve energy efficiency, and use environmentally friendly raw materials, while enhancing economic performance and brand image. These findings support the research of C. Wang, (2022), Khan et al. (2023).

Green Product Innovation does not act as a significant mediator in the relationship between Market Orientation and Sustainable Competitive Advantage (p-value 0.067 > 0.05). Many SMEs still view green innovation as an additional cost burden rather than a strategic tool for competitive advantage. SMEs' market orientation is more focused on quickly and efficiently meeting market needs rather than developing sustainable products. The innovations implemented are incremental and do not address sustainability dimensions in depth. The structure of SMEs' internal resources and capabilities (technology, knowledge, finance) act as barriers to the implementation of green innovation. These findings align with contingency theory, which states that the effectiveness of strategies depends on the fit between internal and external conditions.

Green Product Innovation does not play a significant mediating role in the relationship between Competition and Sustainable Competitive Advantage (p-value 0.055 > 0.05). Although competition is perceived as an external pressure, this pressure does not automatically drive the development of environmentally oriented products as the primary pathway to

achieving SCA. Competition is often perceived by SMEs in terms of price, service speed, and market access, rather than environmentally oriented innovation. Many SMEs lack the technical or financial capabilities for environmentally friendly product transformation and face a dilemma between short-term costs and long-term benefits. High competitive pressure is not accompanied by SMEs' internal readiness to adopt GPI. Structural interventions from the government and relevant stakeholders (e.g., tax incentives, access to clean technology, green entrepreneurship training) are needed for GPI to develop as a response to competition.

Green Product Innovation significantly mediates the relationship between Technology and Sustainable Competitive Advantage (p-value 0.030 < 0.05). This means that technology can enhance Sustainable Competitive Advantage through the application and development of green product innovations. Technology becomes a strategic asset that, when managed properly, can generate environmentally friendly product innovations, which then bridge the gap between technological potential and sustainable competitive advantage. SMEs that effectively utilize technology tend to have higher GPI scores, which in turn enhance customer loyalty, cost efficiency, and business sustainability. The contribution of technology to competitiveness becomes significantly more pronounced when technology is utilized to produce innovative and environmentally friendly products, such as biodegradable packaging or IoT technology for temperature control.

Green Product Innovation does not play a significant mediating role in the relationship between Entrepreneurial Orientation and Sustainable Competitive Advantage (p-value 0.208 > 0.05). Many SMEs lack adequate awareness and knowledge about the importance of environmentally-based product innovation, so EO is not directed toward green strategies. EO among SMEs places greater emphasis on quick responses to short-term market opportunities, without prioritizing sustainability aspects. GPI among food SMEs in West Java remains reactive (responding to regulations/short-term demand) and has not yet become a strategic initiative supporting long-term competitiveness. Innovation infrastructure, green incentives, and local learning networks have not been optimal in driving EO transformation into a competitive advantage through green innovation. This indicates a disconnect between entrepreneurial capabilities and effective transformation into sustainable innovative strategies, despite EO being considered important in the Resource-Based View (RBV) and Dynamic Capabilities frameworks.

The novelty of this research lies in the role of Green

Product Innovation (GPI) in the context of food SMEs in West Java, highlighting how local factors such as business structure and regulations influence the effectiveness of green innovation-based sustainability strategies. This study positions GPI as a central variable that bridges the relationship between internal organizational factors (MO, Competition, Technology, EO) and the achievement of SCA.

Although some independent variables such as Technology and Market Orientation have a significant direct influence on SCA, this study also shows that not all of these direct relationships are effectively mediated by GPI. However, empirical evidence indicates that in the relationship between Technology and Sustainable Competitive Advantage, Green Product Innovation plays a significant mediating role.

These findings constitute an important theoretical contribution as they strengthen the argument that GPI can be developed as a technology-based internal strategy to achieve sustainable competitive advantage, rather than merely a reaction to external pressures. This study presents a complex and contextual map of relationships, where not all organizational capabilities trigger green innovation, and not all green innovations successfully create competitive advantage without the support of technology and adaptive organizational systems.

CONCLUSION

Research on food MSMEs in West Java examined the influence of Market Orientation, Competition, Technology, and Entrepreneurship Orientation on Green Product Innovation and Sustainable Competitive Advantage. All independent variables, namely Market Orientation, Competition, Technology, and Entrepreneurship Orientation, were proven to have a positive and significant effect on Green Product Innovation and Sustainable Competitive Advantage. Crucially, this study found that Green Product Innovation significantly mediates the relationship between Technology and Sustainable Competitive Advantage, indicating that technology adoption can enhance SMEs' competitive advantage through green product innovation. However, Green Product Innovation is not significant as a mediator between Market Orientation, Competition, or Entrepreneurial Orientation and Sustainable Competitive Advantage, often due to internal constraints of SMEs such as short-term focus or resource limitations. The novelty of this study lies in its emphasis on the mediating role of Green Product Innovation in the context of local SMEs.

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